REMARKS

This response is intended as a full and complete response to the Final Office Action mailed on November 10, 2005. In the Office Action, the Examiner notes that claims 1, 2, 4-18, 20-27, 29-43 and 45-50 are pending and rejected. By this response, no amendments have been made and Applicants have provided arguments refuting the Examiner's conclusions.

In view of the following discussion, Applicants submit that none of the claims now pending in the application are obvious under the provisions of 35 U.S.C. §103.

It is to be understood that, Applicants do not acquiesce to the Examiner's characterizations of the art of record or to Applicants' subject matter recited in the pending claims. Further, Applicants are not acquiescing to the Examiner's statements as to the applicability of the art of record to the pending claims by filing the instant arguments.

REJECTIONS

35 U.S.C. §103

Claims 1-2, 4-18, 20-27, 29-43 and 45-50

The Examiner has rejected claims 1-2, 4-18, 20-27, 29-43 and 45-50 under 35 U.S.C. §103(a) as being unpatentable over Campbell (U.S. Patent 4,989,090, hereinafter "Campbell") in view of Kawada (U.S. Patent 5,699,499, hereinafter "Kawada"). Applicants respectfully traverse the rejection.

The test under 35 U.S.C. §103 is not whether an improvement or a use set forth in a patent would have been obvious or non-obvious; rather the test is whether the claimed invention, considered as a whole, would have been obvious. Jones v. Hardy, 110 USPQ 1021, 1024 (Fed. Cir. 1984) (emphasis added). Moreover, the invention as a whole is not restricted to the specific subject matter claimed, but also embraces its properties and the problem it solves. In re Wright, 6 USPQ 2d 1959, 1961 (Fed. Cir. 1988) (emphasis added). The Campbell and Kawada references alone or in combination fail to teach or suggest Applicants' invention as a whole.

As presented earlier, the subject invention employs the use of motion metric values. These values are determined based on available pixel information (i.e., from two frames being processed to determine an interpolated frame) as per Page 4, lines 5-18 of the Specification. The motion metric (identified as Δ) is introduced at Page 4, line 18 of the Specification and further defined at Page 4, lines 25-27. Specifically, "(t)he motion metric Δ at a missing pixel may be defined by employing some combination of the obtained pixel luminance value differences, for example, by Δ =max(Δc, Δa). Additionally, the motion metric Δ can be expressed in a number of other ways as detailed as described Page 5 of the Specification. Once the motion metric values are determined, they are further processed to determine which is best suited (under the concepts of the subject invention) to represent the interpolated frame as per the spatial median filter and process as per Page 6, line 5 – Page 7, line 19. Such best-suited motion metric value is then used in a look up table to arrive at the appropriate blending factor to assess how the pixels are to be interpolated (i.e., based on field or based on frame).

The spatial interpolator 28 of Campbell identified by the Examiner operates directly upon pixels as seen by inspection of FIG. 2 and the accompanying description at Col. 7, lines 8-13. Therefore, it is respectfully submitted that Campbell does not teach or suggest a spatial median filter supplied with at least three motion metric values as claimed. The Examiner has indicated such at Page 6 of his Final Office Action. Additionally, the spatial median filter of FIG. 1 of Kawada operates upon motion vectors (and not motion metric values as claimed) as per the Examiner-indicated portions of the reference at Col. 3, lines 1-9 and also at least at Col. 4, lines15-20 and 39-46. It is respectfully submitted that Kawada does not teach or suggest a spatial median filter supplied with at least three motion metric values as claimed either because it operates upon motion vectors as described in detail below.

The phrase "motion vector" has taken on a very specific meaning in the field of image processing and Applicant offers that such phrase cannot be equated with the claimed element of a motion metric value. That is, these motion metrics are completely different from the expected and known definition of a "motion vector".

One skilled in the art readily identifies motion vector processing with a series of steps which include in part; dividing an image into 16 x 16 pixel macroblocks, splitting the luminance block portion of the macroblock into 4 8 x 8 blocks, performing a DCT operation upon the 8x8 blocks of luminance and chrominance and finally quantizing, filtering and storing the DCT coefficients. There is a clear and distinguishing difference between known motion vectors and motion metrics as claimed and described above. Hence, it is respectfully submitted that Kawada does not teach or suggest a spatial median filter supplied with at least three motion metric values as claimed.

Note that the Applicants have not so much as "argued the Specification" as they have brought forth the fact that there is different definition and interpretation of the claimed "motion metric" element over what the Examiner has cited in the references (i.e., either ordinary pixel processing or motion vectors) or otherwise known in the art. It is submitted that one reading the claims in conjunction with the supporting specification can easily identify such differences and such consideration must be given. "If the claims, read in the light of the specification, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the courts can demand no more." Shatterproof Glass Corp. v. Libbey-Owens Ford Co.. 225 U.S.P.Q. 634, 641 (1985). Additionally, "(w)hen the examiner is satisfied that patentable novelty is disclosed and it is apparent to the examiner that the claims are directed to such patentable subject matter, he or she should allow claims which define the patentable novelty with a reasonable degree of particularity and distinctness. Some latitude in the manner of expression and the aptness of terms should be permitted even though the claim language is not as precise as the examiner might desire." MPEP §706.03(d).

Each of the independent claims is repeated below and highlighted to identify the distinguishing features at issue:

1. Apparatus for use in a video image de-interlacer comprising:

a frame interpolator for yielding a frame based luminance value for a missing pixel by using frame based interpolation;

a field interpolator for yielding a field based luminance value for a missing pixel by using field based interpolation;

a luminance difference unit for obtaining luminance value differences of pixels in prescribed fields of an image in accordance with prescribed criteria;

a motion detector supplied with prescribed ones of said luminance value differences for generating a motion metric value at a missing pixel and for filtering said pixel differences to remove aliases under predetermined motion conditions;

a spatial median filter supplied with at least three of said motion metric values for determining a median motion metric value and for removing random noise from said luminance differences without creating spurious motion values; and

a controllable combiner supplied with said frame based luminance value and said field based luminance value and being responsive to a representation of said median motion metric value to controllably supply as an output a luminance value for said missing pixel,

wherein said controllable combiner, in response to said representation of said median motion metric value indicating the image is still, outputs said frame based luminance value and, in response to said representation of said median motion metric value indicating motion in the image, outputs said field based luminance value.

17. (previously presented) Apparatus for use in a video image de-interlacer comprising:

a frame interpolator for yielding a frame based luminance value for a missing pixel by using frame based interpolation;

a field interpolator for yielding a field based luminance value for a missing pixel by using field based interpolation;

a luminance difference unit for obtaining luminance value differences of pixels in prescribed fields of an image in accordance with prescribed criteria;

a motion detector supplied with prescribed ones of said luminance value differences for generating a motion metric value at a missing pixel and for filtering said pixel differences to remove aliases under predetermined motion conditions;

a look-up table including blending factor values related to said motion metric values and being responsive to supplied motion metric values for supplying as an output corresponding blending factor values;

a spatial median filter supplied with at least three of said blending factor values for determining a median motion metric value and for removing random noise from said luminance differences without creating spurious motion values; and

a controllable combiner supplied with said frame based luminance value and said field based luminance value and being responsive to a said median blending factor value to controllably supply as an output a luminance value for said missing pixel,

wherein said controllable combiner, in response to said representation of said median motion metric value indicating the image is still, outputs said frame based luminance value and, in response to said representation of said median motion metric value indicating motion in the image, outputs said field based luminance value.

26. (previously presented) A method for use in a video image de-interlacer comprising the steps of:

frame interpolating to yield a frame based luminance value for a missing pixel by using frame based interpolation;

field interpolating to yield a field based luminance value for a missing pixel by using field based interpolation;

obtaining luminance value differences of pixels in prescribed fields of an image in accordance with prescribed criteria;

filtering said pixel luminance value differences to remove aliases under predetermined motion conditions;

in response to prescribed ones of said luminance value differences, generating a motion metric value at a missing pixel;

spatial median filtering at least three of said motion metric values to determine a median motion metric value and to remove random noise from said luminance differences without creating spurious motion values; and

controllably combining said frame based luminance value and said field based luminance value and in response to a representation of said median motion

metric value controllably supplying as an output a luminance value for said missing pixel,

wherein said step of controllably combining, in response to said representation of said median motion metric value indicating the image is still, outputs said frame based luminance value and, in response to said representation of said median motion metric value indicating motion in the image, outputs said field based luminance value.

42. (previously presented) A method for use in a video image de-interlacer comprising the steps of:

frame interpolating to yield a frame based luminance value for a missing pixel by using frame based interpolation;

field interpolating to yield a field based luminance value for a missing pixel by using field based interpolation;

obtaining luminance value differences of pixels in prescribed fields of an image in accordance with prescribed criteria;

filtering said pixel luminance value differences to remove aliases under predetermined motion conditions;

in response to prescribed ones of said luminance value differences, generating a motion metric value at a missing pixel;

in response to supplied motion metric values, utilizing a look-up table including blending factor values related to said motion metric values to supply as an output corresponding blending factor values;

spatial median filtering at least three of said blending factor values for determining a median blending factor value and to remove random noise from said luminance differences without creating spurious motion values; and

controllably combining said frame based luminance value and said field based luminance value and in response to said median blending factor value controllably supplying as an output a luminance value for said missing pixel,

wherein said step of controllably combining includes a step, responsive to said median blending factor value indicating the image is still, of outputting said frame based luminance value, and a step, responsive to said median blending factor value indicating motion in the image, of outputting said field based luminance value.

In each instance of the identified independent claims, it is respectfully submitted that the combined teachings of Campbell and Kawada does not teach or suggest motion metrics and performing operations on same as claimed; thus, a gap still exists in the combined teachings of the references. Accordingly, it is believed that independent claims 1, 17, 26 and 42 are allowable over the rejection under 35 U.S.C. §103(a) based on Campbell and Kawada. Additionally, dependent claims 2, 4-16, 18, 20-25, 27, 39-41, 43 and 45-50 depend either directly or indirectly from these independent claims and recite addition features thereof. As such, and for at least the same reasons discussed above with respect to the independent claims, it is submitted that dependent claims 2, 4-16, 18, 20-25, 27, 39-41, 43 and 45-50 are also allowable under 35 U.S.C. §103(a).

CONCLUSION

Thus, Applicants submit that all claims now pending are in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring adverse final action in any of the claims now pending in the application, it is requested that the Examiner telephone Eamon J. Wall at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

1/10/05

E M Wall

Eamon J. Wall, Attorney
Reg. No. 39,414
(732) 530-9404

Patterson & Sheridan, LLP
Attorneys at Law
595 Shrewsbury Avenue, Suite 100
Shrewsbury, New Jersey 07702